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Examiners' Report
June 2013

GCE Biology 6BI01 01

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June 2013

Publications Code US035460

Introduction

This paper tested the knowledge and understanding of the two AS topics: 'Lifestyle, health and risk' and 'Genes and health', together with elements of How Science Works. The range of questions provided plenty of opportunity for candidates to demonstrate their grasp of these AS topics. On the whole, candidates coped extremely well with this paper, finding most of the questions straightforward to tackle; indeed there were very few examples of questions not being attempted at all, with all questions achieving the full spread of marks.

It was good to see how well many candidates could recall several areas of the specification in a good level of detail, including the core practical for measuring the concentration of vitamin C. It was also very pleasing to see very few candidates losing marks for poor quality of written communication (QWC) with answers often set out in a logical style with key biological terms spelt correctly.

Some candidates let themselves down by not reading the questions carefully enough, or by providing a response without the precision required at this level.

Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past. For example, many candidates described the process of protein synthesis rather than DNA replication for Q2(a) as this is something that has been asked on recent papers.

Candidates also need to check their answers for sense. For example why spend all of your time describing the double circulatory system in detail when you are asked to describe why many animals need a heart and circulatory system?

It was very pleasing to see many examples of excellent responses; often being concise, clear and comprehensive, showing a good use of technical terms and biological names.

Question 1(a)

Many candidates scored well in this question and clearly knew the steps involved in blood clotting. Unfortunately marks were sometimes lost by spelling errors that meant the words were not unambiguous. One of the more common errors was to confuse white blood cells and platelets. Candidates who were unfamiliar with the blood clotting process were usually able to get a mark for the word "enzyme" as being the catalyst. It was disappointing to see fibrin and fibrinogen given as answers since these were already referred to in the text.

1 (a) Read through the following passage on the blood clotting process, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The blood clotting process starts when cell fragments called platelets

release molecules of thromboplastin. These molecules

are enzymes which catalyse the conversion of prothrombin

into thrombin, in the presence of calcium ions. As a result, fibrinogen

is converted into fibrin and blood cells are trapped to form the clot.

ResultsPlus
Examiner Comments

This response gains all five marks available.

This is an example of a response that gained three of the five marks available.

1 (a) Read through the following passage on the blood clotting process, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The blood clotting process starts when cell fragments called Thromboplastin

release molecules of white blood cells. These molecules

are enzymes which catalyse the conversion of Prothrombin

into thrombin, in the presence of calcium ions. As a result, fibrinogen

is converted into fibrin and blood cells are trapped to form the clot.

ResultsPlus
Examiner Comments

The candidate clearly knows many of the terms involved in the blood clotting process. However, they have made mistakes with the first two responses.

ResultsPlus
Examiner Tip

For fill in the blanks questions make sure you read back over your response in the context of the whole passage to make sure it makes sense.

This response gained three of the five marks available.

1 (a) Read through the following passage on the blood clotting process, then write on the dotted lines the most appropriate word or words to complete the passage.

(5)

The blood clotting process starts when cell fragments called platelets release molecules of thromboplastin. These molecules are enzymes which catalyse the conversion of fibrinogen into fibrin, in the presence of calcium ions. As a result, fibrinogen is converted into fibrin and blood cells are trapped to form the clot.

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Examiner Comments

The first three answers are correct, but this candidate made the common mistake of including fibrinogen and fibrin as the last responses, despite those molecules being used in the sentence immediately afterwards.

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Examiner Tip

Read through the complete passage to help guide what will be the most appropriate words to use. The passage is unlikely to repeat itself so it is best not to repeat words as they are unlikely to be the most appropriate to use.

Question 1(b)(i)

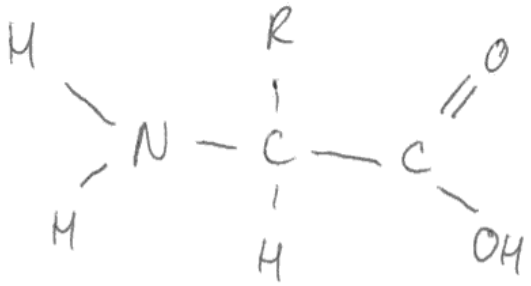
Over 50% of candidates gained all three marks for the structure of an amino acid. The most common errors were to miss the hydrogen attached to the central carbon, or make bonding errors for the carboxyl or amino group. Some candidates named the groups instead of drawing the structure as requested. Several candidates tried to draw nucleotides and a few attempted a modified monosaccharide.

(b) Fibrinogen and fibrin are both proteins.

A protein consists of a chain of amino acids joined together by bonds.

(i) In the space below, draw a diagram to show the structure of an amino acid.

(3)



ResultsPlus
Examiner Comments
This example gained all three marks available.

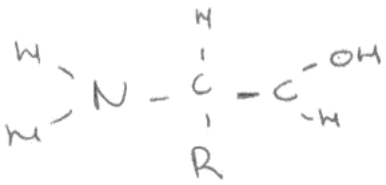
This response scored two of the three marks available.

(b) Fibrinogen and fibrin are both proteins.

A protein consists of a chain of amino acids joined together by bonds.

(i) In the space below, draw a diagram to show the structure of an amino acid.

(3)



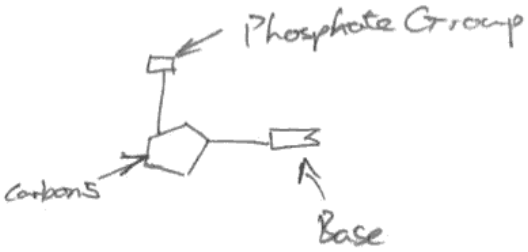
ResultsPlus
Examiner Comments
This is a typical example of a candidate who lost a mark for an error in the carboxyl group.

• (b) Fibrinogen and fibrin are both proteins.

A protein consists of a chain of amino acids joined together by bonds.

(i) In the space below, draw a diagram to show the structure of an amino acid.

(3)



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Examiner Comments

This is an example of the many responses seen where the candidate drew a nucleotide rather than an amino acid. This is also a model rather than a structural diagram of the molecule.

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Examiner Tip

When asked to draw the structure of a molecule, make sure you show the relevant atoms and bonds, particularly for functional groups.

Question 1(b)(ii)

Few problems with this question as over 80% of candidates recognised that amino acids are joined with a peptide bond. The most common error was naming a glycosidic bond instead.

(ii) Name the covalent bond that joins the amino acids into a chain. (1)

Peptide

ResultsPlus
Examiner Comments
This is an example of the correct response.

(ii) Name the covalent bond that joins the amino acids into a chain. (1)

hydrogen bond

ResultsPlus
Examiner Comments
This is an example of an incorrect bond type. There are hydrogen bonds in a protein, but they are not covalent bonds and are not the principle bonds joining the amino acids together into a chain.

(ii) Name the covalent bond that joins the amino acids into a chain. (1)

Polypeptide Bond

ResultsPlus
Examiner Comments
This response did not gain the mark as polypeptide is not the name of the bond but the molecule that is produced.

Question 1(b)(iii)

Many candidates gained one mark for recognising the different solubilities of the proteins. Better responses also recognised that the proteins were either globular or fibrous, or were different sizes. Several candidates got the two molecules the wrong way round and many did not make comparative comments by only referring to just one of the proteins. Many candidates gave low level descriptions of functions e.g. fibrin traps red blood cells, fibrinogen is an enzyme.

(iii) Suggest **two** differences between fibrinogen and fibrin.

(2)

1 ~~fibrin~~ fibrinogen is soluble whereas fibrin is insoluble

2 fibrin molecules have a long, fibrous strand structure whereas fibrinogen is a globular protein

(Total for Question 1 = 11 marks)

ResultsPlus
Examiner Comments

This is an example of a response that gained both available marks.

This response scored no marks.

(iii) Suggest **two** differences between fibrinogen and fibrin.

(2)

1 fibrin are long strands

2 fibrin needs to be ~~et~~ catalysed

ResultsPlus
Examiner Comments

Fibrin and fibrinogen. If they had stated that fibrin was long and fibrinogen was much shorter they would have gained a mark. Similarly if they had said that fibrinogen is a globular protein in comparison to this first statement they would have been given the mark even though it lacks some precision.

ResultsPlus
Examiner Tip

When asked for a difference between two things make sure you mention both in your response for a clear comparison.

Question 2(a)

This question specifically relates to specification point 2.12 'Explain the nature of the genetic code'. It was therefore disappointing to see how many candidates failed to pick up on the basic idea of the triplet code.

Many answers were general descriptions of genes controlling protein synthesis, references to alleles providing hereditary information, the structure of DNA, chromosomes, etc. Details of the structure of the DNA molecule were common also.

Where candidates did identify the importance of bases they often referred to the sequence coding for amino acids rather than specifically 3 bases coding for one amino acid. Some candidates thought that one triplet codes for one protein.

A significant number of candidates thought that the sequence of amino acids on the DNA was the genetic code.

Where the bases were listed, candidates often just referred to A, T, C and G (it should be noted that the full names are included as part of the specification) or made errors in the names e.g. glycine instead of guanine.

This response gained both marks available.

2 DNA is a very important molecule in living organisms as it carries the genetic code. Before a cell divides, the DNA molecule replicates so that each resulting daughter cell is genetically identical to the original parent cell.

(a) Explain the nature of the genetic code.

(2)

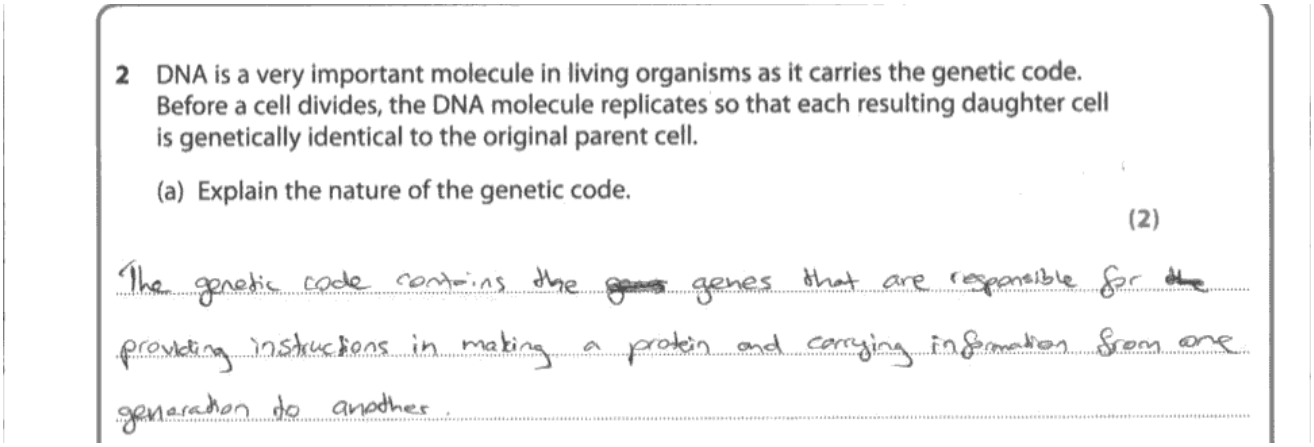
The genetic code is a triplet code. The genetic code is linear and non overlapping. And the genetic code can be degenerated, more than one codon can code for one amino acid.

ResultsPlus

Examiner Comments

This is an excellent response that goes beyond the scope of the AS specification as they have actually made five relevant comments about the nature of the genetic code in a concise response.

This response gained no marks.



2 DNA is a very important molecule in living organisms as it carries the genetic code. Before a cell divides, the DNA molecule replicates so that each resulting daughter cell is genetically identical to the original parent cell.

(a) Explain the nature of the genetic code.

(2)

The genetic code contains the ~~gene~~ genes that are responsible for ~~the~~ providing instructions in making a protein and carrying information from one generation to another.

ResultsPlus
Examiner Comments

This is a typical example of a candidate who does not understand the meaning of the specification term 'genetic code'.

ResultsPlus
Examiner Tip

The genetic code is the language of the genes and is an important specification point. Make sure you understand the triplet nature of the code - 3 DNA bases code for one amino acid.

Question 2(b)

This was generally well answered with a significant number of candidates addressing at least 5 marking points successfully. The best responses demonstrated an understanding of semi conservative replication and bonding within the DNA molecule, with several candidates demonstrating knowledge beyond the AS specification.

It was very pleasing to see that spelling of key terms was good, and we rarely saw mistakes.

It was a common omission that the nucleotides line up along both strands – often only referring to complementary base pairing to one of the strands.

Unfortunately, many candidates confused DNA replication with protein synthesis and lost by describing stages of transcription or translation instead.

This response gained all five marks available.

*(b) Describe the process of DNA replication.

(5)

It is called semi-conservative replication - where copies of DNA are produced which are exact replicates of the original parent DNA. In this new DNA, 1 strand originates from original DNA while the other is new. The DNA double helix unwinds, firstly, exposing the bases on the strand, DNA helicase enzyme is involved. These strands acts as templates where free bases in the nucleus/cytoplasm pairs off [complementary base pairing - with corresponding base of the DNA-strand] A-T, G-C. Hydrogen bonding takes place between the bases and later nucleoside bond is formed with deoxyribose pentose sugar and phosphodiester bond with a phosphate group. The [condensation] between Between these mononucleotides condensation takes place with the help of DNA polymerase and DNA ligase. As a result 2 new strands are formed.

(Total for Question 2 = 7 marks)

ResultsPlus

Examiner Comments

Although not all aspects of this response are perfect, this is an example of many candidates who had a very good grasp of the process of replication. The stages are clear, they understand the term semi-conservative and are aware of examples of enzymes and chemicals and bonds involved.

This response gained one of the five marks available.

*(b) Describe the process of DNA replication.

(5)

The DNA ~~molecule~~ molecule contains two strands. ~~This~~ ~~This strand~~ The DNA ~~molecul~~ molecule unwinds ~~itself~~ itself, after which the ~~two~~ two strands are seperated. After these two ~~str~~ strands ~~are~~ are seperated, ~~the~~ the alleles in the DNA strand forms an opposite allele that goes ~~with~~ with the original one. Once the alleles are formed, the DNA strand gets ~~togethe~~ together and recoils itself, ~~and~~ reveting two new ~~DNA's~~ DNAs formed.

ResultsPlus
Examiner Comments

This candidate gained a mark for recognising that the DNA unwinds at the beginning. They have not included much specific detail and have confused some of their key terms such as alleles and nucleotides.

ResultsPlus
Examiner Tip

When revising biochemical processes like replication, make sure you learn the molecules involved in the process as it will help you gain credit at AS/A2 level.

This response gained two of the five marks available.

*(b) Describe the process of DNA replication.

(5)

DNA replication is the process of transcription and Translation. In transcription the DNA unwinds ~~one~~ and the Hydrogen bonds are exposed as RNA polymerase helps to break them up. One strand acts as a template. Complementary base pairing occurs between the free nucleotides. Transcription takes place in the nucleus. Translation Takes place in the cytoplasm. The mRNA line up against the DNA strand and complementary base pairing occurs. different triplet codes code for different amino acid. A molecule of tRNA takes the amino acid from the cytoplasm back into the nucleus.

ResultsPlus

Examiner Comments

This is a typical example of a candidate describing the wrong process. However, they gained credit for recognising a relevant enzyme and that DNA needs to unwind as there are some similarities in the process of replication and transcription.

ResultsPlus

Examiner Tip

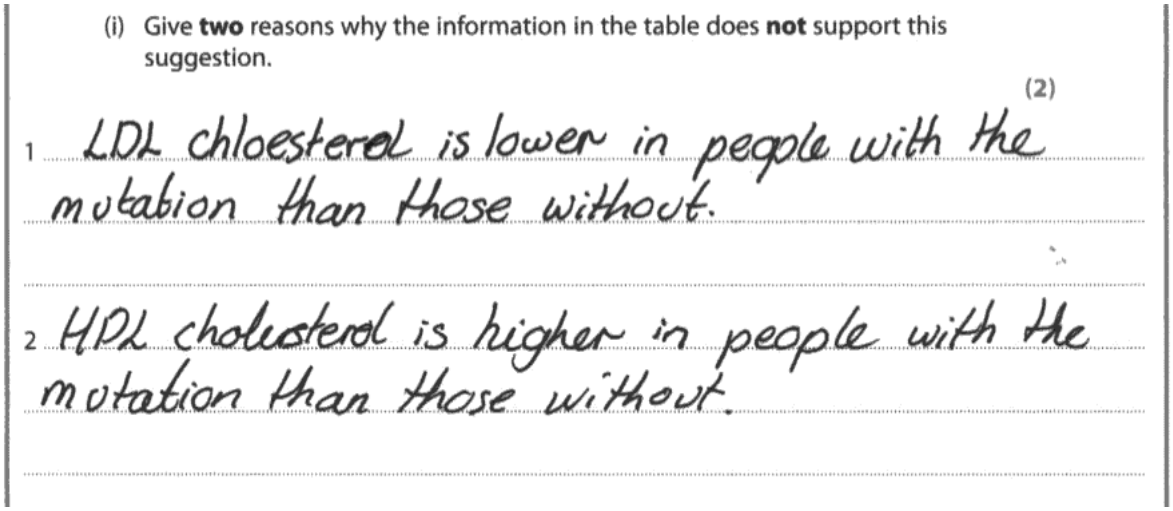
Read the question carefully and make sure you write about the correct process and not a process that was asked for in a previous exam.

Question 3(b)(i)

Q3(a): Most candidates had few difficulties with the multiple choice questions about lipid hydrolysis with between 70 and 90% correct response rates for each item. The most common errors were to think that catalysts increase the rate of reaction by increasing the activation energy; water is formed in a hydrolysis reaction; and glycosidic bonds are found in triglycerides.

Q3(b)(i): This question was well answered with most candidates interpreting the data well and relating it to which components are associated with risks of developing CVD.

This response gains both of the available marks.



(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

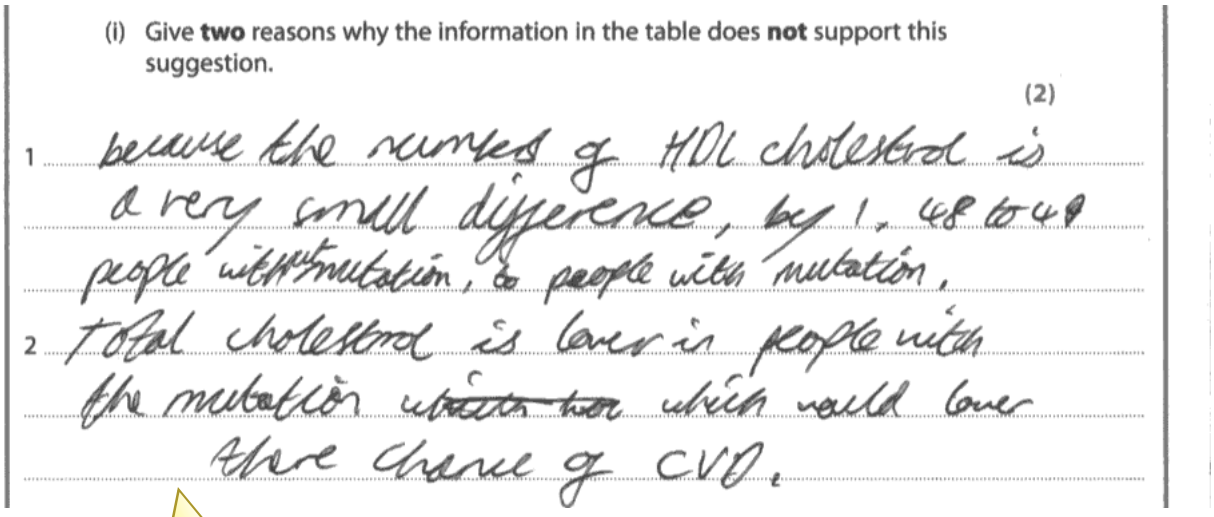
1 LDL chloesterol is lower in people with the mutation than those without.

2 HDL cholesterol is higher in people with the mutation than those without.

ResultsPlus
Examiner Comments

Correct comparisons have been made with LDL and HDL levels, both of which have an influence on the risk of developing CVD.

This response gains both available marks.



(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

1 because the numbers of HDL cholesterol is a very small difference, by 1. 48 to 49 people with mutation, to people with mutation,

2 total cholesterol is lower in people with the mutation ~~which~~ which would lower there chance of CVD.

ResultsPlus
Examiner Comments

As well as the correct statement about total cholesterol, they recognise that the key factor is that the differences are very small (particularly for HDL).

This response did not gain any marks.

(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

1 There are more people without the mutation of the gene that have a higher total cholesterol than those with the mutation.

2

ResultsPlus
Examiner Comments

The statement made is not possible to conclude from the data in the table as there is no indication about the cholesterol levels of individuals within the groups.

ResultsPlus
Examiner Tip

Take care about over interpreting data.

This response failed to gain any marks.

(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

1 LDL chloesterol is lower in people with the mutation than those without.

2 HDL cholesterol is higher in people with the mutation than those without.

ResultsPlus
Examiner Comments

The first statement is wrong from the data in the table. The second statement is not worthy of credit as they have said that total cholesterol is reduced. This is not a clear comparative statement with those without the mutation and we have no indication in the data about changes in the lipid levels within the populations, just comparative mean values.

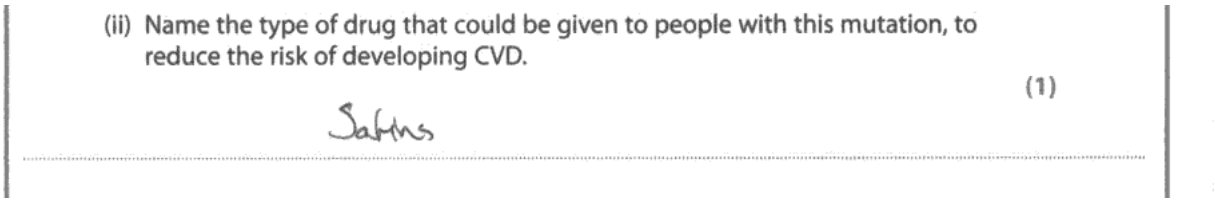
ResultsPlus
Examiner Tip

Make sure statements are comparative and think carefully over the appropriate use of words such as lower and reduced as they have different meanings and suit different contexts.

Question 3(b)(ii)

The majority of candidates recognised that statins would be the suitable drug type to use in the context of this mutation. However, a significant number of candidates did mention anticoagulants.

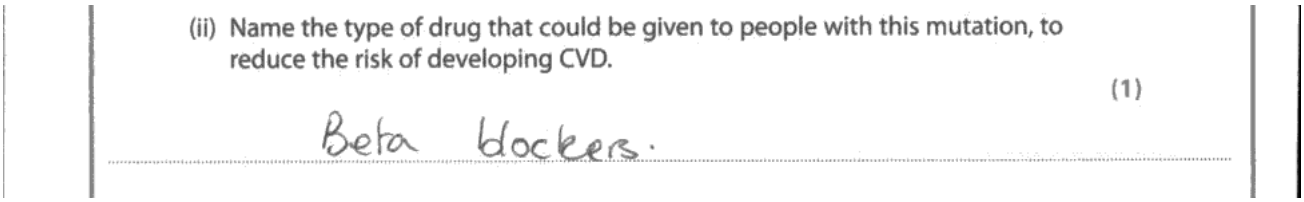
This is an example of the correct response.


(ii) Name the type of drug that could be given to people with this mutation, to reduce the risk of developing CVD.

(1)

Statins

This is an example of an incorrect response that did not gain the mark.


(ii) Name the type of drug that could be given to people with this mutation, to reduce the risk of developing CVD.

(1)

Beta blockers.

ResultsPlus

Examiner Comments

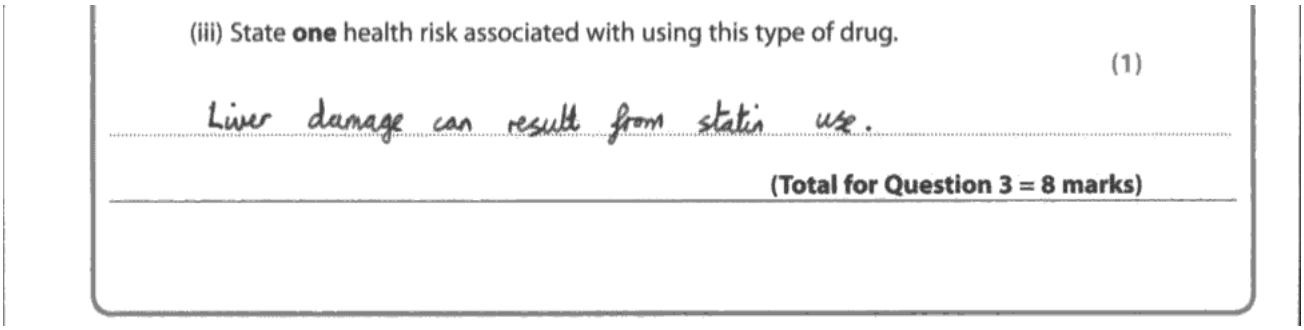
Check the context of the question carefully. The mutation in this question is linked to lipid levels in the blood so the most appropriate drugs will be those that might help reduce cholesterol levels in the blood.

Question 3(b)(iii)

With such a long list of possible side effects of statin use most candidates were able to gain credit, most for liver, kidney or muscle issues. The most common errors were to state that statins increase the risk of cancer or reduce the absorption of vitamins from the digestive system.

Candidates were asked to state **one** health risk, but many provided a list of risks instead.

This response gained the mark.


(iii) State **one** health risk associated with using this type of drug.

(1)

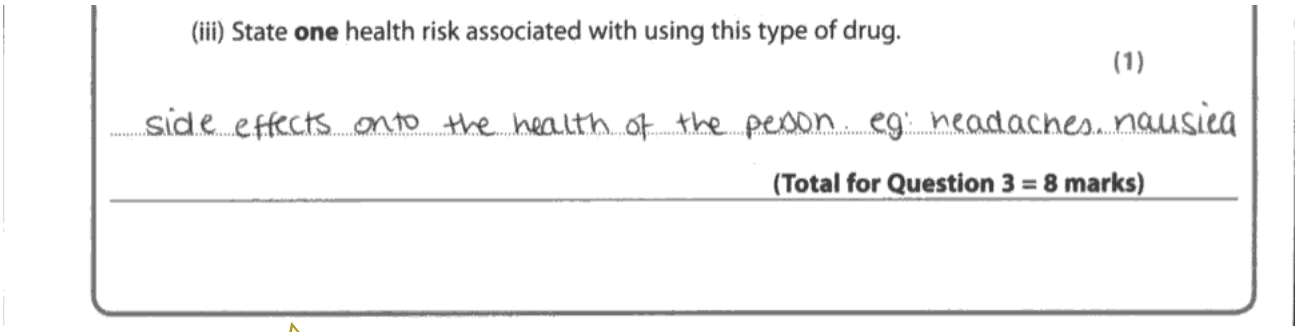
Liver damage can result from statin use.

(Total for Question 3 = 8 marks)

ResultsPlus
Examiner Comments

This is an example of one of the most common correct responses.

This response gained the mark.


(iii) State **one** health risk associated with using this type of drug.

(1)

side effects onto the health of the peoon eg: headaches. nausiea

(Total for Question 3 = 8 marks)

ResultsPlus
Examiner Comments

This candidate has recognised some side effects as risks and gained credit. However, the question did ask for **one** health risk and not two.

ResultsPlus
Examiner Tip

If a word is in bold in a question stem take careful note.

(iii) State **one** health risk associated with using this type of drug.

(1)

Could prevent vitamins being absorbed by liver.

(Total for Question 3 = 8 marks)

ResultsPlus

Examiner Comments

This is an example of one of the most common responses that did not gain the mark.

Question 4(a)

Many candidates recognised that flatworms have a high surface area to volume ratio and/or that the body is very thin, together with how this related to diffusion. Candidates who lost marks just referred to gas exchange and not diffusion or surface area alone.

Some candidates simply stated that a flatworm is flat which was not deemed worthy of credit. Other candidates referred to thin cell membranes or even thin cells walls.

This response gained both available marks.

(a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

(2)

Flatworms have a large surface area to volume ratio so can rely on simple diffusion to obtain oxygen from the water. They have a large surface area so there are lots of opportunities for oxygen to diffuse through. The flatworms are also very thin so there are short diffusion distances. Oxygen will move by osmosis down a concentration gradient from the water where it is high in concentration through the cell surface membrane and into the cytoplasm of the flatworm.

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Examiner Comments

The candidate has recognised both the surface area to volume ratio and the thin body to aid the diffusion of oxygen, including explaining that it is helped due to the short diffusion path.

However, the statement re. oxygen moving by osmosis at the end is clearly wrong and an error by the candidate.

ResultsPlus

Examiner Tip

Remember osmosis is the name given to the diffusion of water and is not used to describe the movement of other molecules and ions.

This response gained no marks.

(a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

(2)

they have a thin membrane to ~~a~~ allow diffusion of oxygen to their bodies. they have also alote of mitochondria to provide ATP for active transport.

ResultsPlus

Examiner Comments

Many candidates referred to the flat worm having a thin membrane - their cell membranes are no thinner than any other cell membrane.

They also appear to think that active transport is involved in the process.

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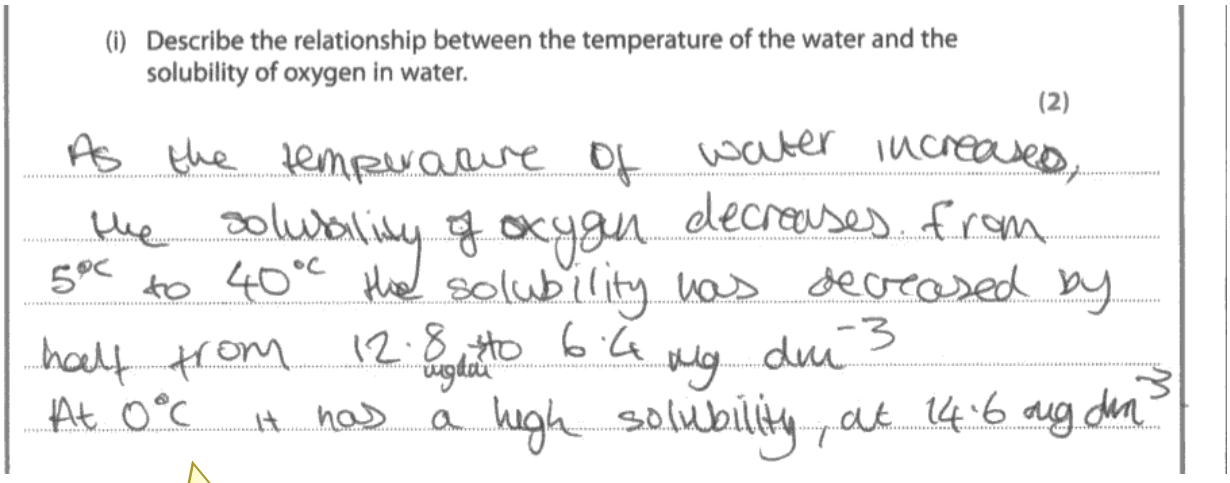
Examiner Tip

Be careful not to confuse cell membranes with cells in exchange surfaces. It is also a good idea to refer to features shown on the diagram when a question asks you to use the diagram.

Question 4(b)(i)

Describing the negative correlation between temperature and oxygen solubility was an easy mark for nearly all candidates. It was pleasing to see candidates taking the trouble to correctly calculate differences in figures or percentage changes. There were noticeably fewer "it's roughly", "it's about" statements in answers than in previous years. Some candidates still need to realise that no credit will be given for just quoting figures from the table.

This response gained both marks available.



(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

(2)

As the temperature of water increased, the solubility of oxygen decreases. from 5°C to 40°C the solubility has decreased by half from 12·8 to 6·4 mg dm^{-3} At 0°C it has a high solubility, at 14·6 mg dm^{-3}

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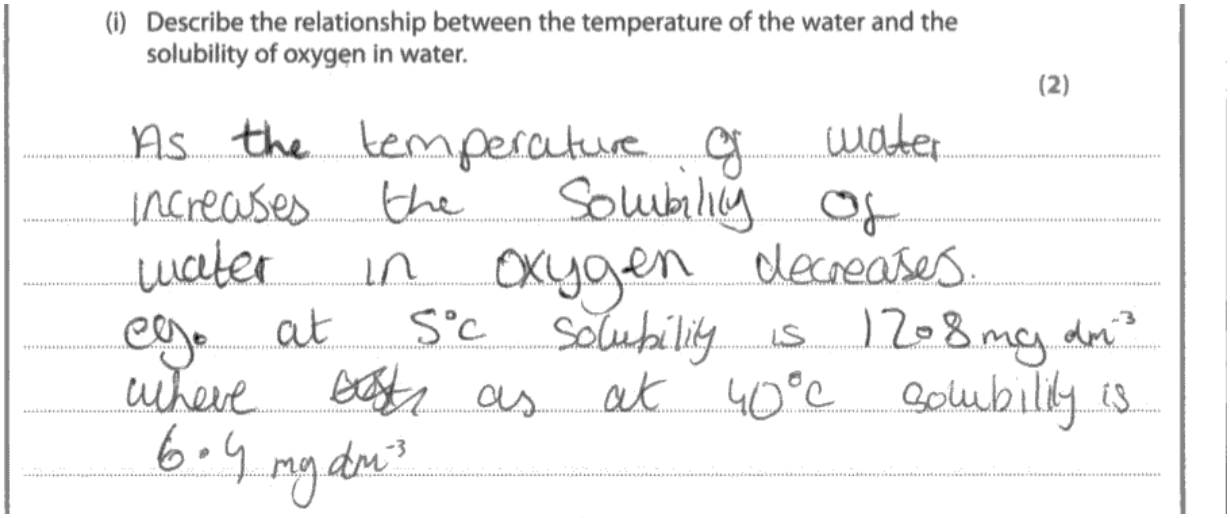
Examiner Comments

This candidate has recognised the trend and supported it with a suitable manipulation of figures i.e. the halving between 5 and 40°C.

This response gained one of the two marks available.



(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

(2)

As the temperature of water increases the solubility of water in oxygen decreases. eg. at 5°C solubility is 12·8 mg dm^{-3} where as at 40°C solubility is 6·4 mg dm^{-3}

ResultsPlus
Examiner Comments

This candidate gained credit for the trend, but just quoting figures is not sufficient for gaining a mark for manipulation of figures.

ResultsPlus
Examiner Tip

When analysing data from a table or graph it is best to calculate a difference, rate, gradient, or similar that represents the point you have made in order to gain a mark for the correct manipulation of figures. Quoting the data may help illustrate the point you have made, but is rarely worthy of credit as a separate mark.

Question 4(b)(ii)

There were some excellent answers to this question with candidates demonstrating a good application of enzyme knowledge and concentration gradients to the context given.

Most candidates recognised that enzymes were temperature dependent but many also thought they were denatured at low temperatures as well as high temperatures. Only the better responses gave a good description about why reactions would be slower at lower temperatures and that it was a matter of balance between enzyme activity and oxygen concentrations.

Some candidates related their answers to membrane permeability and others thought that enzymes were directly involved in gas exchange. Some candidates thought that the higher oxygen levels at lower temperatures were toxic to the flatworms.

Candidates should note that just quoting the solubility of the oxygen at 15°C is not sufficient for credit.

This response gained all three marks available.

(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15 °C.

(3)

AT temperatures aroun 15°C enzymes won't be denatured and there's still a higher enough level of oxygen in the water for a concentration gradient to be maintained for oxygen to diffuse into the flatworm. At temperatures lower than 15°C enzymes wouldn't work fast enough and at temperatures above 15°C oxygen levels in the water would be too low.

ResultsPlus

Examiner Comments

This candidate recognises that low temperatures affect enzyme activity and that high temperatures would reduce the oxygen available for the flatworms, which are the key points of the question.

This response gained two of the available three marks.

(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15 °C .

(3)

because at 15°C there is a high solubility of oxygen in the water, this means that the flatworms can maintain a steep concentration gradient where there is more oxygen in the water than in their bodies to keep oxygen diffusing into their blood. However the temperature cannot be too low or it may denature the active site of enzymes making them unable to form an enzyme substrate complex and therefore unable to ~~be~~ catalyse a reaction.

ResultsPlus

Examiner Comments

This candidate gained credit for the comments on oxygen concentration and concentration gradients for diffusion. However, they have not gained credit for their comments about enzymes as it is not true that the enzyme is likely to denature at low temperatures.

ResultsPlus

Examiner Tip

Low enzyme activity and denaturing are not fully interchangeable.

(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15 °C .

(3)

• At 15°C the solubility of oxygen in water is 10.2 mg dm^{-3}

• This means that there is plenty of oxygen for the flatworms to take in but the water isn't too cold for them to not be able to function properly.

ResultsPlus

Examiner Comments

This response just gained the one mark for the comment on the level of oxygen in the water. Too cold to function is not clear or precise enough for credit at this level.

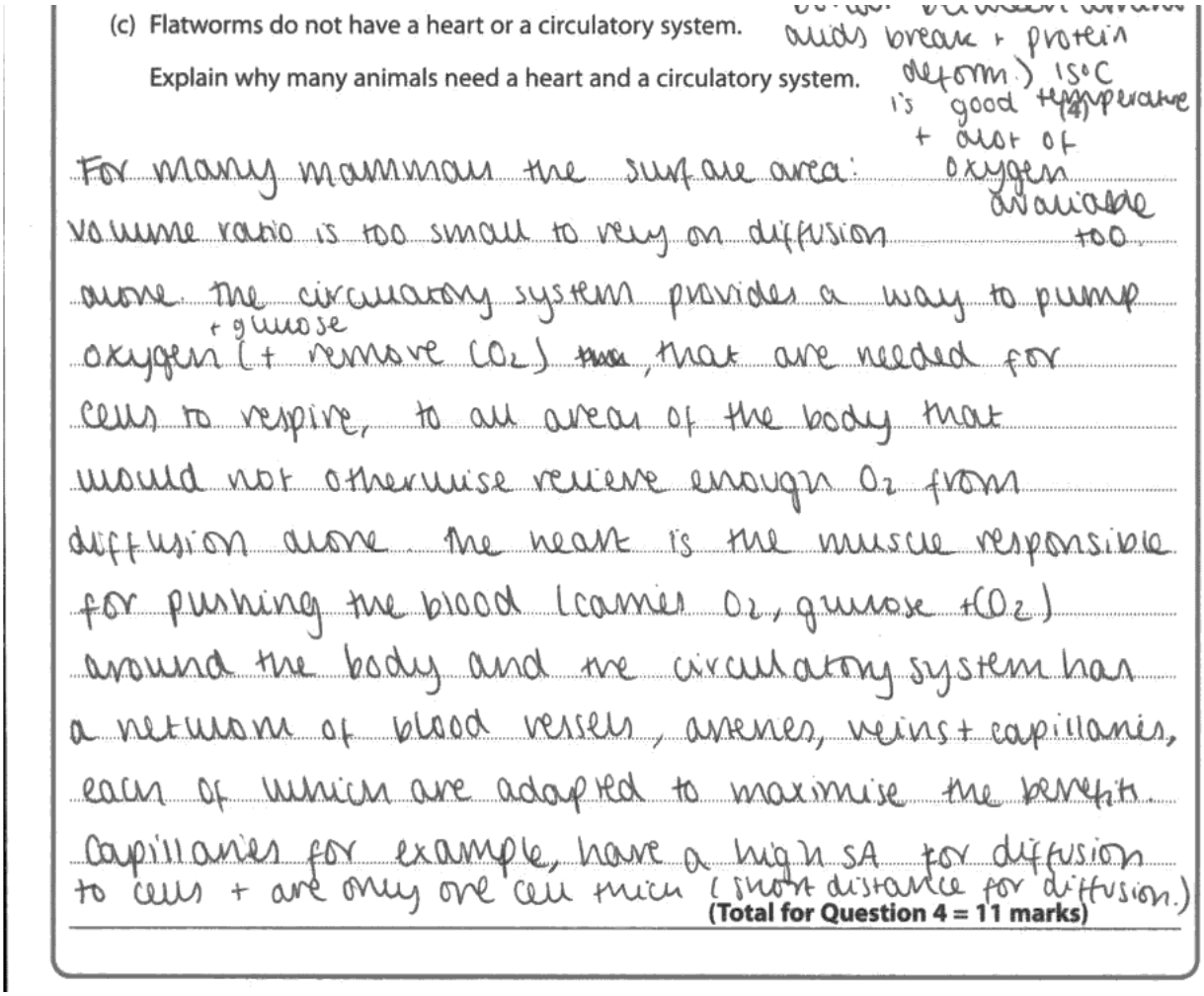
Question 4(c)

Most candidates were clearly familiar with the idea that diffusion alone is insufficient as a means of getting oxygen into all of the cells of larger animals. This was often correctly linked and stated with respect to the surface area to volume ratio.

A common error was to refer to the "mass transport" system, rather than "mass flow", although most recognised the heart's role in the circulatory system.

Many candidates often focused upon the need for a 4 chambered heart to separate oxygenated and deoxygenated blood, sometimes describing in detail the overall structure of the double circulatory system which was not what was asked for in the question.

This response gained all four marks available.



(c) Flatworms do not have a heart or a circulatory system.

Explain why many animals need a heart and a circulatory system. (4)

For many mammals the surface area : volume ratio is too small to rely on diffusion alone. The circulatory system provides a way to pump oxygen (+ glucose + remove CO_2) that are needed for cells to respire, to all areas of the body that would not otherwise receive enough O_2 from diffusion alone. The heart is the muscle responsible for pushing the blood (carries O_2, glucose + (O_2) around the body and the circulatory system has a network of blood vessels, arteries, veins + capillaries, each of which are adapted to maximise the benefit. Capillaries for example, have a high SA for diffusion to cells + are only one cell thick (short distance for diffusion.)

(Total for Question 4 = 11 marks)

ResultsPlus
Examiner Comments

This candidate recognises the problems that large animals have - low surface area to volume ratio for gas exchange at the surface and that diffusion is not sufficient. They also explain what the heart does and what the circulation system carries in their explanation of why animals need a heart and circulatory system.

ResultsPlus
Examiner Tip

This clip also shows what happens when the answer from a previous question extends beyond the space provided. If your answer continues beyond the space available please indicate this clearly in the original answer space so that it is clear to the examiner that there is more to your answer, as they can only see the clips like those included in this report.

This response gained one of the four marks available.

(c) Flatworms do not have a heart or a circulatory system. The higher the solubility, more O_2 transported, so higher concentration gradient (4) for diffusion so diffusion happens quicker.

Explain why many animals need a heart and a circulatory system.

Animals need a circulatory system so that blood can be flow all around the body, it is used as a mass transport system so that oxygen can be taken to all areas. this is so that cells are able to respire. Capillaries are used so that blood can be transported to all parts of the body. Circulatory system is also used for metabolic rate and also for regulating and maintaining temperature. The circulatory system is also used for the removal of metabolic waste via the blood. Blood is used to transport O_2 and CO_2 around the body

(Total for Question 4 = 11 marks)

ResultsPlus

Examiner Comments

This candidate has provided plenty of detail about what the circulation system carries around the body for credit, but has not described what the heart does or why some animals need them in the context of flatworms not needing them.

ResultsPlus

Examiner Tip

Read the question carefully, think about the context and check you are answering the question that has been asked.

Question 5(a)(i)

Most candidates could correctly state a number of differences between the structure of reduced and oxidised DCPIP, although a few candidates lost marks for not stating which molecule they were referring to. Other candidates made mistakes by referring to O or N molecules and hydrogen bonds.

This response gains both marks available.

(i) Using the diagram, describe **two** differences between the structure of oxidised DCPIP and reduced DCPIP.

(2)

1 Oxidised DCPIP contains a double bond between Nitrogen and the carbon on its right. Reduce DCPIP does not and this nitrogen has a hydrogen bonded to it.

2 Reduced DCPIP contains two ~~an~~ alcohol functional groups, one is on the far right coming off a carbon whose ~~which~~ ~~is~~ adjacent ~~to car~~ carbon has a chlorine atom. Oxidised DCPIP has an oxygen atom here to which it is double bonded to.

ResultsPlus

Examiner Comments

The comparative comments about double bonds and hydrogens are all correct for maximum credit.

(i) Using the diagram, describe **two** differences between the structure of oxidised DCPIP and reduced DCPIP.

(2)

1 the oxidised DCPIP only has 7 hydrogens whereas the ~~r~~ reduced DCPIP has 9 hydrogens.

2 the oxidised DCPIP has 7 double bonds whereas the reduced DCPIP has 6 double bonds

ResultsPlus
Examiner Comments

This response gains both marks for the correct numerical comparisons about the number of double bonds and hydrogen atoms.

This response gained one of the two available marks.

(i) Using the diagram, describe **two** differences between the structure of oxidised DCPIP and reduced DCPIP.

(2)

1 The structure of oxidised DCPIP is different to reduced DCPIP because reduced DCPIP has two more hydrogens than oxidised DCPIP has.

2 They also differ because reduced DCPIP has 7 double bonds compared to oxidised DCPIP that only has 6 double bonds.

ResultsPlus
Examiner Comments

The first statement about hydrogen is correct, but the second statement about the number of double bonds is the wrong way round.

ResultsPlus
Examiner Tip

It is easy to make mistakes like this. When answering comparative questions like this double check that what you have written is the right way round.

This response gained no marks.

(i) Using the diagram, describe **two** differences between the structure of oxidised DCPIP and reduced DCPIP.

(2)

1 a hydrogen bond is formed in reduced DCPIP to the central nitrate ~~ring~~ atom..

2 a hydrogen bond is formed in reduced DCPIP to the oxygen atom.

ResultsPlus

Examiner Comments

The candidate has got the correct idea about the differences between the molecules, but their quality of expression has let them down. There are no more hydrogen bonds shown on the diagram, but there are more hydrogens bonded to atoms in the molecule.

ResultsPlus

Examiner Tip

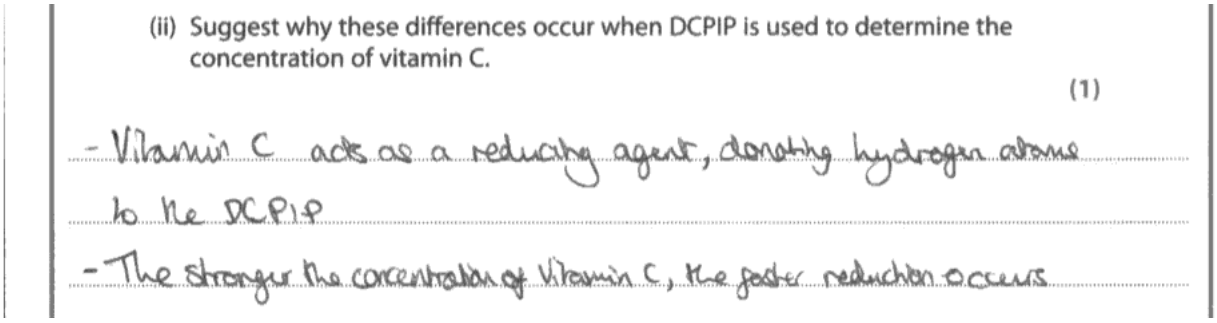
Take care with describing atoms bonding so you don't muddle the names of the bonds with the names of the atoms.

Question 5(a)(ii)

Many candidates failed to understand that vitamin C was acting as a reducing agent, or struggled to explain this chemical concept.

Some candidates wrongly stated that the DCPIP had become reduced by the vitamin C because vitamin C neutralised it or diluted it. Others said that it had been hydrolysed because water had been added. Some had some knowledge but could not decide whether to add or remove the electrons and hydrogens.

This response gained the available mark.



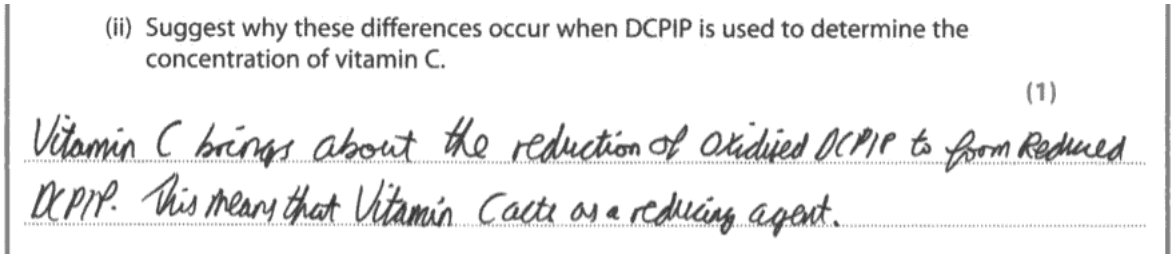
(ii) Suggest why these differences occur when DCPIP is used to determine the concentration of vitamin C.

(1)

- Vitamin C acts as a reducing agent, donating hydrogen atoms to the DCPIP
- The stronger the concentration of Vitamin C, the faster reduction occurs

ResultsPlus
Examiner Comments

This is an example of a very good response that clearly explains the role of the vitamin C in bringing about the chemical change in the DCPIP and also how it can be used to interpret the results.



(ii) Suggest why these differences occur when DCPIP is used to determine the concentration of vitamin C.

(1)

Vitamin C brings about the reduction of oxidised DCPIP to form Reduced DCPIP. This means that Vitamin C acts as a reducing agent.

ResultsPlus
Examiner Comments

This is a typical example of a good response that gained the mark.

This response did not gain any marks.

(ii) Suggest why these differences occur when DCPIP is used to determine the concentration of vitamin C.

(1)

To see if there is any change when a concentration of vitamin C is added.

ResultsPlus
Examiner Comments

This is typical of a large number of responses that did not explain why the changes occurred but tried to answer the question 'why use DCPIP?'

ResultsPlus
Examiner Tip

Read the question carefully. By reading the rest of the question you may also pick up on useful hints, for example the focus on the differences between oxidised and reduced DCPIP in the previous question could provide valuable clues as to what is happening in this chemical reaction.

(ii) Suggest why these differences occur when DCPIP is used to determine the concentration of vitamin C.

(1)

The vitamin C breaks the bond, because its acidic

ResultsPlus
Examiner Comments

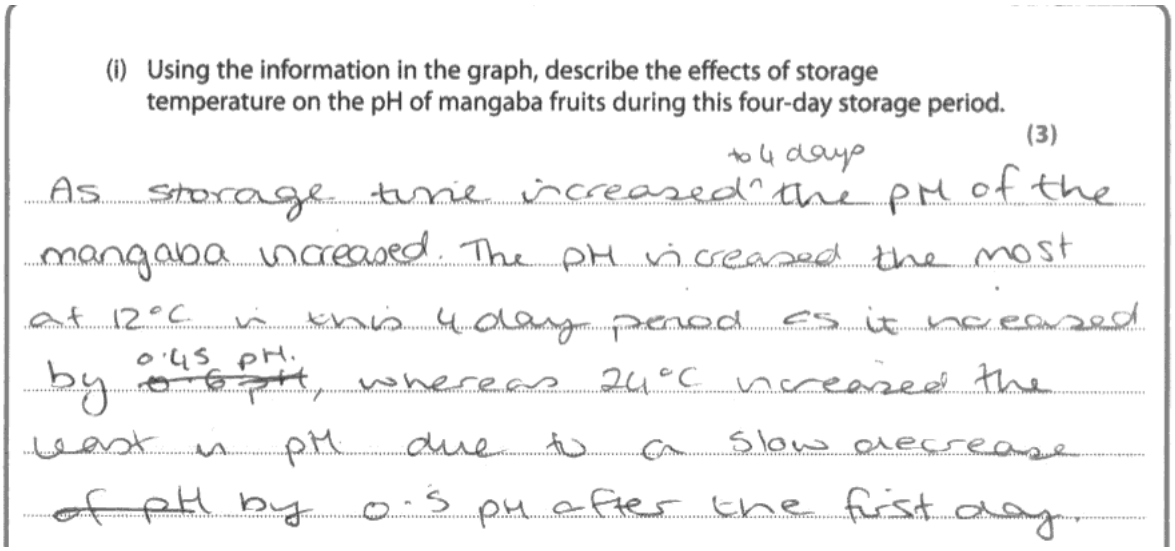
This response is an example of a common error for this question.

Question 5(b)(i)

Most candidates recognised an increase in pH with increased storage time, although many candidates described the change in pH in the context of temperature change rather the storage time. Also when candidates attempted to manipulate the data it was quite common

Many candidates managed to correctly manipulate figures to demonstrate the changes in pH. However, many candidates made mistakes due to misreading the scale of the graph (for example by putting the decimal point in the wrong place e.g. 0.3 difference between 6°C and 8°C instead of 0.03) or figures were merely quoted rather than manipulated.

This response gained all three marks available.



(i) Using the information in the graph, describe the effects of storage temperature on the pH of mangaba fruits during this four-day storage period.

(3)

As storage time increased to 4 days the pH of the mangaba increased. The pH increased the most at 12°C in this 4 day period as it increased by 0.45 pH, whereas 24°C increased the least in pH due to a slow decrease of pH by 0.3 pH after the first day.

ResultsPlus

Examiner Comments

This candidate clearly recognises the overall trends with storage time, points out the highest gain, the initial dip for 24°C and has two examples of correct changes calculated.

ResultsPlus

Examiner Tip

This is a good example of how to tackle a data interpretation question:

1. Identify the main trend.
2. Point out any extremes, changes in the patterns of the data.
3. Manipulate figures to illustrate the points you have made.

This response gained no marks.

(i) Using the information in the graph, describe the effects of storage temperature on the pH of mangaba fruits during this four-day storage period.

(3)

different storage temperatures cause the fruit to have varying pH, at ~~6~~ 6°C the pH is 3.2 after 4 days however at 8°C it has dropped to about 3.17 pH. Then at 12°C it rose to about 3.35 pH then dropped again at 24°C to about 2.95 pH. The graph doesn't seem to show a pattern with storage temperature and pH of fruit

ResultsPlus

Examiner Comments

This is unfortunately a typical example of a candidate just quoting a lot of values from the graph and not making any correct manipulations or describing any clear trends from the data.

ResultsPlus

Examiner Tip

When presented with data in a table or graph avoid just quoting a lot of figures directly from the data.

Question 5(b)(ii)

Most candidates demonstrated a good knowledge of this core practical outlining the key points on how to measure vitamin C content and that repeats were required. However many were unclear about the colour change, often just saying it went colourless, or saying to add DCPIP until it went colourless.

A significant number of candidates focused on obtaining a calibration curve using standard solutions of vitamin C but then failed to say how this would be used for this experiment.

Some candidates misinterpreted the question by describing an experiment about the effect of pH on vitamin C content (not storage temperature).

Weaker responses involved adding chunks of fruit to DCPIP. A significant number described storing juice once it had been extracted. Worryingly some candidates described 'the beetroot experiment'.

This response gained all five marks available.

*(ii) Describe an experiment that could be carried out to compare the changes in the vitamin C content of the mangaba fruit stored at 6 °C and 8 °C.

(5)

Fruit could be picked and stored at these two temperatures. At 1day intervals, juice from fruit at both temperatures could be taken an titrated against an identical known volume of DCPIP solution and the volume of juice required to make the solution go from dark blue to colourless recorded. This could be repeated with several different fruits stored at the same temperatures using the same volume of DCPIP solution and averages taken. To work out the Vitamin Content from these results, a calibration curve could be made using solutions of known concentration of Vitamin C and the same volume of DCPIP solution. A graph could be made showing the change in vitamin C concentration of the fruits over time to compare them. The moisture in the air of the room that the fruit were kept in at both temperatures would need to be kept constant.

ResultsPlus

Examiner Comments

This is an excellent example of the thorough and concise response that met the majority of the mark points available, demonstrating a good understanding of the practical techniques used in the core practical and how to apply them to the context of the question.

This response gained all five marks available.

*(ii) Describe an experiment that could be carried out to compare the changes in the vitamin C content of the mangaba fruit stored at 6 °C and 8 °C.

(5)

A large sample of the fruit could be stored at 6°C and the same number at 8°C. Every day, three fruit from each temperature should be taken and juiced, and then the juice from each fruit should be titrated with 10ml of a 1% solution of DCPIP, to see how much of the juice is required to decolourise the solution. This should be repeated with each of the three fruit from the 8°C batch (and an average volume found) and then repeated with the 6°C batch. The experiment should then be repeated every day for several days, and then the volumes required to fully react with the DCPIP from each temperature plotted onto a graph.

ResultsPlus
Examiner Comments

This response gained credit for:

- using extracted juice;
- titration;
- use of repeats;
- controlling other variables (volume and concentration of DCPIP);
- testing at regular intervals of time.

ResultsPlus
Examiner Tip

Although this response gained full credit it could have been even better if they described what the colour change was (particularly in the context of the earlier sections of the question).

It would also be helpful if they described the purpose of the graph.

This response gained three of the available marks.

*(ii) Describe an experiment that could be carried out to compare the changes in the vitamin C content of the mangaba fruit stored at 6 °C and 8 °C.

(5)

Extract the vitamin C from mangabas stored at 6°C and at 8°C perhaps by extracting a juice. measure equal solutions of DCIP in a test tube. ~~Have 2 sets~~ Prepare 2 test tubes one for each temperature. Using a pipette add the vitamin C solution prepared to the DCIP drop by drop until it turns colour less. measure how many drops are needed to make the DCPIP go colour less. Repeat results to increase reliability.

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

This response gained credit for:

- extracting the juice from the stored fruit;
- the description of titration;
- repeats.

This response gained no marks.

*(ii) Describe an experiment that could be carried out to compare the changes in the vitamin C content of the mangaba fruit stored at 6 °C and 8 °C.

(5)

An experiment that could be carried out could ~~be~~ start by: -

→ cutting the mangaba fruit into five equal pieces. rinsing away any excess pigment that leaked.

→ Get our 5 test tubes and put the pieces of mangaba fruit inside each one. The put them in water baths of ~~temperature~~ different temperatures (e.g 10°c, 20°c, 30°c, 40°c, 50°). Take them out of the baths.

ResultsPlus
Examiner Comments

This is an example of a response that has muddled techniques from a couple of core practicals. They have ignored the context of the question apart from the fruit and temperature and started to describe the beetroot membrane permeability practical.

ResultsPlus
Examiner Tip

Read the whole question carefully so you pick up on the context the practical technique is being applied to.

Question 6(a)

This question was very well answered, with most candidates correctly identifying and stating the hydrophilic and hydrophobic nature.

Most candidates were not specific about the attraction of the hydrophilic heads to water (often it was that they "turn to water" or "face water" or are "in water"). Many candidates merely used the terms "water loving" and "water hating" to describe the orientation.

Several candidates got their heads and tails mixed up, or described the whole phospholipid as being polar with a positive head and a negative tail.

Some candidates answered from the point of view of arrangement in relation to function rather than orientation of molecules in a polar environment. Few clearly identified the significance of aqueous environment each side of the bilayer.

This response gains all three marks available.

6 The structure and properties of the cell membrane control which molecules can move into or out of the cell.

(a) The phospholipid bilayer plays an important role in this control of movement of molecules.

Explain why the phospholipid molecules form a bilayer.

(3)

Phospholipid bilayers are formed due ~~to~~ to the phospholipids hydrophilic and hydrophobic nature. The phospholipid head is hydrophilic, this means that it is attracted to water and therefore will form the outer layer of the bilayer. ~~and~~ The tails of the phospholipid are hydrophobic, this means they repel water and hence go to the inside of the bilayer and form a fluid centre.

ResultsPlus

Examiner Comments

As well as describing the heads and tails as hydrophilic and hydrophobic, this response has also gained credit for recognising that the heads are attracted to water that causes their orientation.

This response gained two of the three marks available

6 The structure and properties of the cell membrane control which molecules can move into or out of the cell.

(a) The phospholipid bilayer plays an important role in this control of movement of molecules.

Explain why the phospholipid molecules form a bilayer.

(3)

phospholipid molecules form a bilayer because the phosphate head is hydrophilic and is polarised so that it faces outwards and the fatty acid tail is hydrophobic so it faces inwards. This makes the phospholipid bilayer soluble so it can be transported in a solvent easily.

As well as Phospholipids, there are also glycoproteins and glycolipids present, arranged like tiles in a mosaic.

Also Cholesterol is present and bonds with the phospholipid molecules making the membrane very rigid.

A bilayer is formed to allow small molecules like glucose to enter it by diffusion and large molecules cannot and need Channel or Carrier proteins to do so.

ResultsPlus
Examiner Comments

The candidate correctly identifies the hydrophilic and hydrophobic parts of the phospholipid for two marks. However, they fail to go on to explain the orientation of the molecules in the membrane in relation to the aqueous surroundings. Instead they are distracted by functions of the membrane and other features.

ResultsPlus
Examiner Tip

Concentrate on the question asked and avoid distractions if possible.

This response gained one of the three marks available.

6 The structure and properties of the cell membrane control which molecules can move into or out of the cell.

(a) The phospholipid bilayer plays an important role in this control of movement of molecules.

Explain why the phospholipid molecules form a bilayer.

(3)

The phospholipids forms a bilayer between the membrane which are accompanied by protein channels, where the ~~phosfate~~ phosphate group, head is faced towards the water and fatty acid tail away from water. The bilayer protein th transports molecules can ions from a higher concentration to a lower concentration.

ResultsPlus

Examiner Comments

This candidate has gained credit for the orientation of the fatty acid tails, but has not explained why the heads and tails will face in opposite directions.

The phosphate head facing the water is not sufficient for credit as it is chemically attracted to the water.

Question 6(c)(i)

Q6(b):

Few candidates struggled to identify the correct transport processes for these multiple choice questions. The most common error was to either mark more than one process against the description, or to confuse facilitated diffusion, osmosis and diffusion (probably by ignoring the example molecule or ion transported by this method included in the table).

Q6(c)(i):

Candidates often demonstrated poor writing skills in comparing the two models. They often described the fluid mosaic model but didn't compare it to the D-D model and struggled with the terms intrinsic proteins, protein channels and often just referred to the bilayer. Many just focussed on the lack of detail seen in the D-D model.

Many did, however, recall that cholesterol/glycoproteins were present in the fluid mosaic model.

This response gains both available marks.

(i) Use the information in the diagram to compare the Davson-Danielli model with the fluid mosaic model.

(2)

Davson Danielli model has protein layer outside the phospholipid bilayer, where the fluid mosaic model has protein layer with the phospholipid bilayer. There is no indication of any cholesterol or glycoprotein and glycolipid in the Davson Danielli model where as the fluid mosaic model shows ~~glyco~~ glycoprotein and glycolipids along with integral and peripheral protein

ResultsPlus

Examiner Comments

This example of a very good response gains credit for recognising:

- both models have proteins and a phospholipid bilayer;
- the proteins are distributed differently in the two models;
- the fluid mosaic model includes other components in addition to the proteins and phospholipids, unlike the D-D model.

This response scored no marks.

(i) Use the information in the diagram to compare the Davson-Danielli model with the fluid mosaic model.

(2)

The Dawson-Danielli model is very basaic, however the fluid mosaic model is more detailed showing you all components involved.

ResultsPlus
Examiner Comments

This response is typical of many responses that compared the simplicity of the models without going into details about the components themselves.

This response failed to score any marks.

(i) Use the information in the diagram to compare the Davson-Danielli model with the fluid mosaic model.

(2)

The Davson - Danielli model has 3 three layers. Whereas, the fluid mosaic model has only two layers. ~~(phospholipi~~ ~~called the phospholipid bilayer~~.

ResultsPlus
Examiner Comments

This simplistic comparison of the models does not gain any credit, particularly as the D-D model is labelled as having a phospholipid bilayer.

Question 6(c)(ii)

This question was poorly answered by the majority of candidates. Many candidates did mention protein carriers/channels but not their function. Few recognised the likely inability of D-D model to carry out osmosis, diffusion, exocytosis or endocytosis.

This response gained both marks available.

(ii) Explain why the Davson-Danielli model does not support our current knowledge of how molecules can move through the cell membrane.

(2)

It doesn't show the diffent ~~protein~~ protein types needed for the diffent transport methods. For example carrier protein for active transport or channel protein for facilitated diffusion. It also ~~the~~ would not be able to explain the processes of Endocytosis or Exocytosis by vesicles for the cell membrane

(Total for Question 6 = 10 marks)

ResultsPlus
Examiner Comments

The candidate has clearly linked the lack of carrier proteins in the D-D model to the relevant transport process. They have also recognised that model will make endocytosis and exocytosis impossible.

This response gains both marks available.

(ii) Explain why the Davson-Danielli model does not support our current knowledge of how molecules can move through the cell membrane.

(2)

A protein layer would not allow lipid soluble molecules to pass through. ~~Molecules~~ meaning Simple diffusion of some molecules would not be able to happen.

This model would also not allow membranes to fuse and therefor prevent endocytosis ~~and~~ and exocytosis.

ResultsPlus
Examiner Comments

This candidate has recognised that the protein layer will be a barrier to diffusion and the barrier to membrane fusion will prevent endocytosis and exocytosis.

This response failed to score any marks.

(ii) Explain why the Davson-Danielli model does not support our current knowledge of how molecules can move through the cell membrane.

(2)

~~It says that the two sides are~~ It does not allow the hydrophillic heads of the phospholipids in the bilayer to be in contact in water or allow carrier and channel proteins to be present.

ResultsPlus

Examiner Comments

The reference to carrier and channel proteins is correct, but unfortunately is not enough for credit as they need to be linked to a transport process for how molecules can move through the cell membrane.

Question 7(a)

Many candidates failed to link the mutation to a change in the DNA base sequence – if anything, it was described as a change in the amino acid sequence, or an error in transcription.

Many candidates did, however, identify implications of stop codes, frame shifts, etc. and that a wrong protein would be synthesised, or transcription/translation would not occur. Some of the best responses recognised that a frame shift mutation would have a more significant impact on the protein than the substitution of a single base.

Many candidates did just mention mutations as 1 base change and then 1 amino acid change showing that many candidates think 1 amino acid change is automatically a completely different protein.

A majority of candidates merely concluded that the mutation would stop the protein being made – which was just repeating the stem of the question.

This response gains both available marks.

(a) For class I cystic fibrosis, suggest how a mutation in the CFTR gene could result in no CFTR protein being synthesised.

(2)

The mutation in the CFTR gene could change the sequence of bases on the CFTR gene. This could be through an inversion, insertion, duplication, deletion or substitution. This would in turn alter the mRNA sequence which travels to a ribosome, so would in turn alter the sequence of amino acids in the primary structure of the protein. For example, it may cause a stop codon to be introduced at the beginning of the triplet codons on the mRNA sequence, signalling to the ribosome to stop letting tRNA molecules bind to the mRNA, causing the protein to have no primary structure.

ResultsPlus

Examiner Comments

This response demonstrates a good understanding of different types of gene mutation and how they will affect the primary structure of a protein. It also provides a good example of a catastrophic mutation producing a stop codon in the wrong place.

This response gained no marks.

(a) For class I cystic fibrosis, suggest how a mutation in the CFTR gene could result in no CFTR protein being synthesised.

(2)

one or more

During translation ~~the~~ ✓ incorrect anticodons could have joined resulting in ~~a faulty~~ no CFTR protein being synthesised.

ResultsPlus
Examiner Comments

This response is typical of many responses that lacked precision and therefore did not gain any credit at this level.

This response gains both marks available.

(a) For class I cystic fibrosis, suggest how a mutation in the CFTR gene could result in no CFTR protein being synthesised.

(2)

A mutation such as a deletion or addition can change the sequence of bases. This means a different linear sequence of amino acids will be given. This is the primary structure and will affect/determine the tertiary structure of the protein due to interactions between R groups and different bonds such as ionic and hydrogen forming. Therefore, a different protein other than CFTR is produced. However, if substitution is on third base it might have no effect as it is said to be degenerate as more than one codon code for one amino acid.

ResultsPlus
Examiner Comments

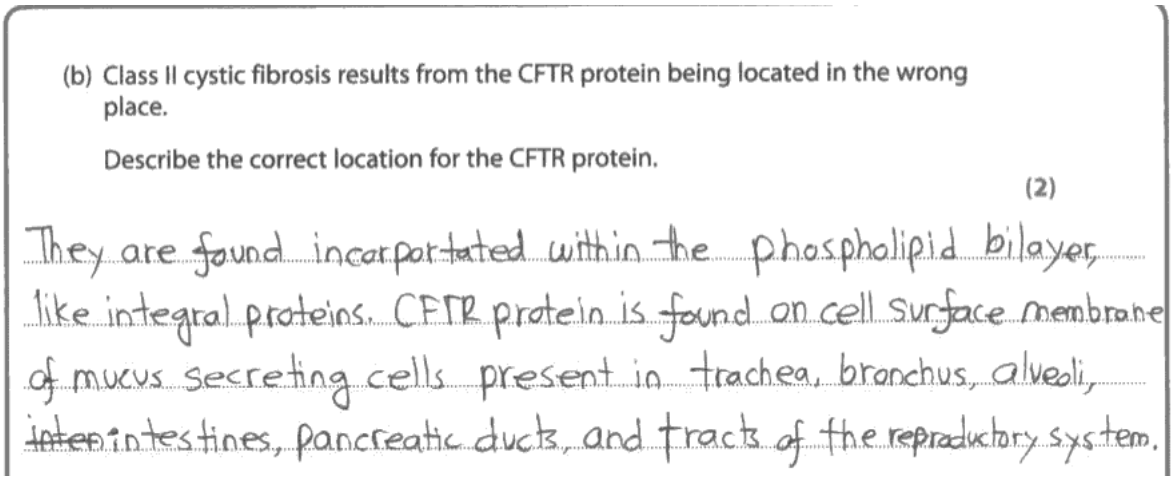
There is a good description of how a mutation could result in a different protein. In particular, the candidate has demonstrated a good understanding of the genetic code, including its degenerate nature, which is a level expected at A2 rather than AS level.

Question 7(b)

Many candidates knew the location of the CFTR protein but many failed to score full marks because the locations they gave were not precise enough e.g. "on cell membranes in lungs" rather than "in the cell membranes of lung epithelial cells".

Some candidates stated that the protein was on chromosome 7 confusing the gene with the protein.

This response gains both available marks.



(b) Class II cystic fibrosis results from the CFTR protein being located in the wrong place.

Describe the correct location for the CFTR protein.

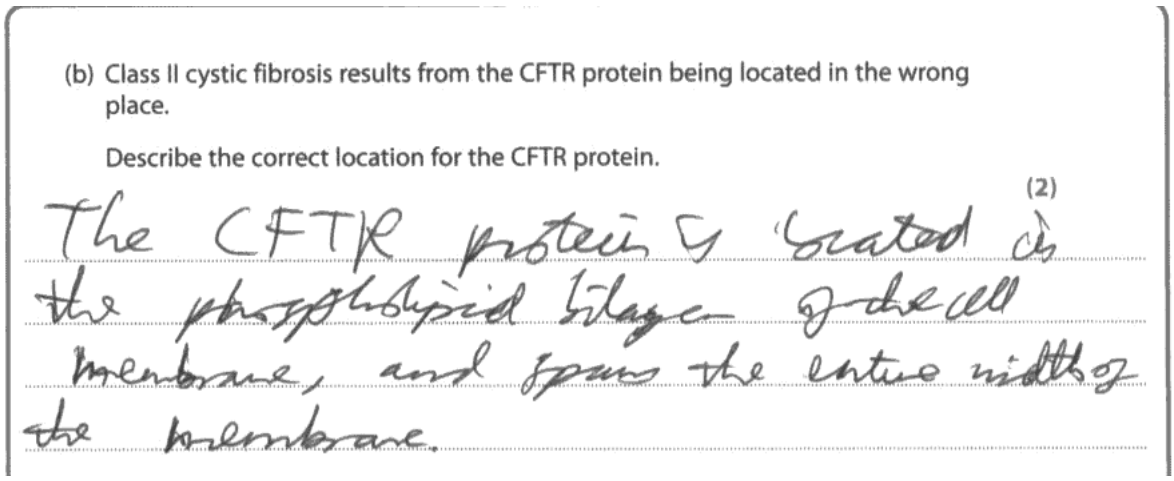
(2)

They are found incarporated within the phospholipid bilayer, like integral proteins. CFTR protein is found on cell surface membrane of mucus secreting cells present in trachea, bronchus, alveoli, intenintestines, pancreatic ducts, and tracts of the repraductory system.

ResultsPlus
Examiner Comments

As well as getting the correct location in the cell for the protein, this candidate has also identified some cells it will be found in.

This response gains one of the two marks available.



(b) Class II cystic fibrosis results from the CFTR protein being located in the wrong place.

Describe the correct location for the CFTR protein.

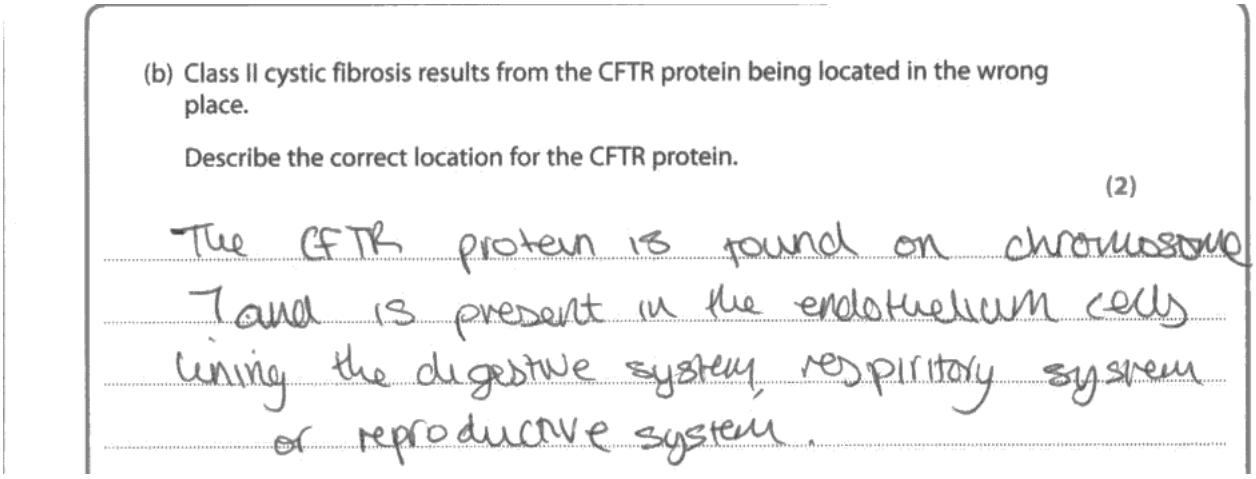
(2)

The CFTR protein is located in the phospholipid bilayer of the cell membrane, and spans the entire width of the membrane.

ResultsPlus
Examiner Comments

The candidate clearly identifies where in the cell you would find the protein, but not which cells it needs to be a part of.

This response gains one of the two marks available.



(b) Class II cystic fibrosis results from the CFTR protein being located in the wrong place.

Describe the correct location for the CFTR protein.

(2)

The CFTR protein is found on chromosome 7 and is present in the endothelium cells lining the digestive system, respiratory system or reproductive system.

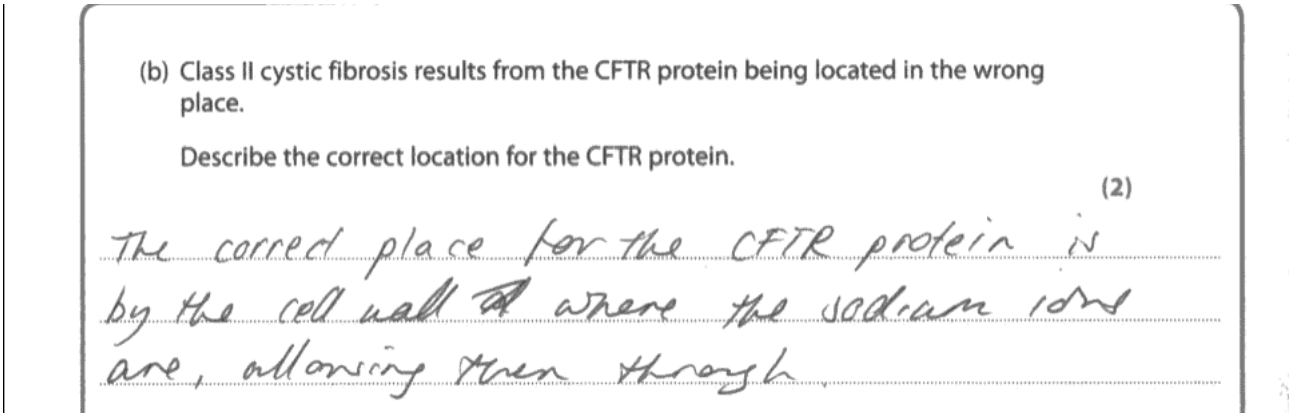
ResultsPlus
Examiner Comments

The candidate does not gain any credit for chromosome 7 as that is a position for the gene and not the protein. However, they have recognised which cells and systems the protein is needed in for a mark.

ResultsPlus
Examiner Tip

Try not to confuse genes and their products.

This is an example of a response that did not gain any marks.



(b) Class II cystic fibrosis results from the CFTR protein being located in the wrong place.

Describe the correct location for the CFTR protein.

(2)

The correct place for the CFTR protein is by the cell wall where the sodium ions are, allowing them through.

ResultsPlus
Examiner Comments

Remember you don't get cell walls in animals, but you do get walls made out of cells. Be very careful when using the term cell wall in a response unless you are describing a plant or bacterial cell.

Question 7(c)

Many candidates could recall the primary structure definition well and most could then describe why this mis-folded. In direct contrast to question 7(a) many candidates described a change in the base sequence rather than amino acid sequence.

A significant number of candidates described the way in which the folding of the secondary structure would be wrong with reference to alpha helices and beta pleated sheets, without any mention of the bonding between the amino acids. Some referred to different peptide bonds.

Some candidates simply reworded the question in the answer.

This response gains both marks available.

(c) The mutation causing class III cystic fibrosis results in a change in the primary structure of the CFTR protein.

Explain why this would result in the CFTR protein being mis-folded.

(2)

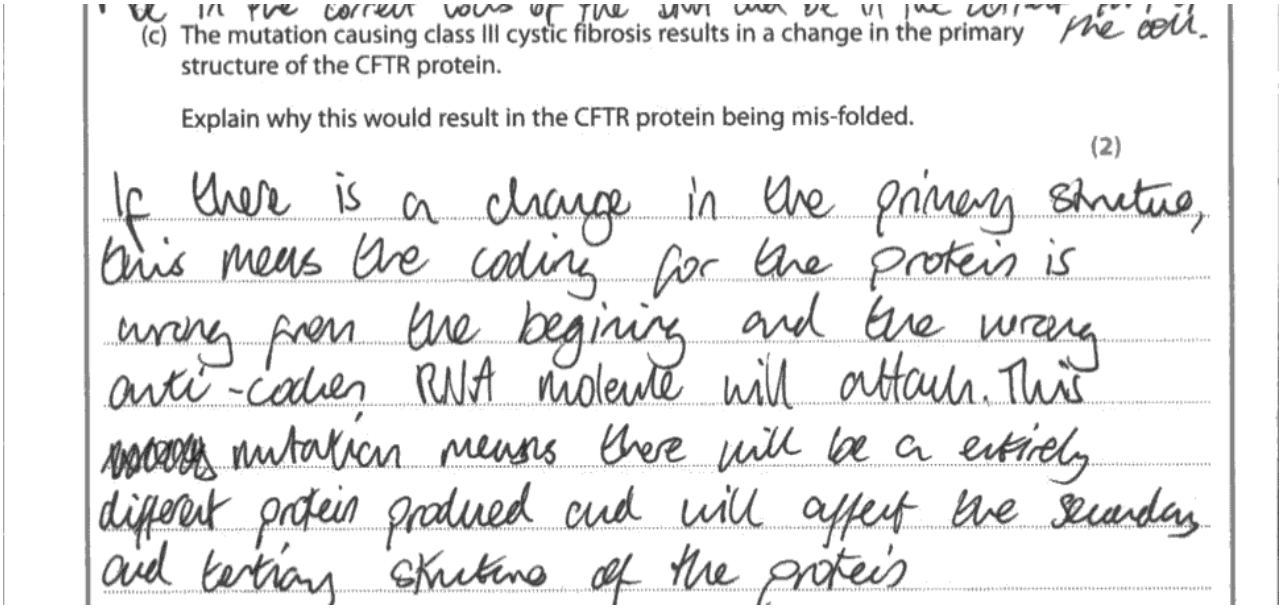
A different primary structure means that there is a different linear sequence of amino acids and therefore a different sequence of R groups. There will be different interactions between the R groups and different bonds such as ionic and disulfide bridges will form. This will result in the protein being folded in a different way (ie the tertiary structure)

ResultsPlus

Examiner Comments

This response is typical of the many which demonstrated a good understanding of the primary structure of a protein and how the sequence of amino acids will affect the folding through the bonds made.

This response gained no marks.



(c) The mutation causing class III cystic fibrosis results in a change in the primary structure of the CFTR protein.

Explain why this would result in the CFTR protein being mis-folded.

(2)

If there is a change in the primary structure, this means the coding for the protein is wrong from the begining and the wrong anti-codon RNA molecule will attach. This mutation means there will be a entirely different protein produced and will affect the secondary and tertiary structure of the protein

ResultsPlus

Examiner Comments

This response is typical of those that did not demonstrate an understanding of what the primary structure of a protein is, or how they are folded into their functional shapes.

Question 7(d)

Few candidates demonstrated a good recall and understanding of the CFTR function so the term channel protein was seldom used and many thought the CFTR channel transported sodium of calcium ions, or even chlorine. Many candidates confused the channel protein with an enzyme and there were a lot of references to active sites.

Many candidates gave a long but imprecise description of why you would get sticky mucus without addressing what this question asked with regard to the functioning of this protein.

This response gained both available marks.

(d) For class IV cystic fibrosis, explain why a faulty opening of the CFTR protein would affect the functioning of this protein.

(2)

A faulty opening of the CFTR protein, would mean that Cl^- ions could not move out of the cell into the mucus through CFTR channel protein. Therefore, Na^+ ions would move by facilitated diffusion from the mucus to the tissue fluid. Then taken by active transport into tissue fluid. This would create an electrochemical gradient which Cl^- ions would follow by diffusion. Resulting in water following by osmosis out of mucus making it thick and sticky.

ResultsPlus

Examiner Comments

This is an example of a good response from a candidate who clearly understands the causes of cystic fibrosis. Both marks needed for the question are covered in the first sentence. The rest of the response, although correct, is not relevant to the specific question asked about the functioning of the protein and is therefore not needed.

This response failed to score any marks.

(d) For class IV cystic fibrosis, explain why a faulty opening of the CFTR protein would affect the functioning of this protein.

(2)

Stops water entering into the cell membrane, causing the mucus to be thick and sticky.

Due to ~~lack~~ increase in Sodium ions.

ResultsPlus
Examiner Comments

This is a typical response for those candidates who were aware of the some of the processes involved in the problems of cystic fibrosis, but did not answer the specific question asked.

ResultsPlus
Examiner Tip

This question specifically asks about the functioning of the CFTR protein which is not involved directly in the movement of water or sodium ions. Read the questions carefully and try to be as precise as possible in your responses.

This response gained no marks.

(d) For class IV cystic fibrosis, explain why a faulty opening of the CFTR protein would affect the functioning of this protein.

(2)

The active site is not the right shape and ~~arena~~ which means that the substrate won't fit. This means that the reaction ~~take~~ will not take place because the CFTR protein opening is faulty. Each enzyme is specific and if it is not correct then the substrate won't bind to it.

ResultsPlus
Examiner Comments

This response is typical of those who confused the CFTR protein with an enzyme and therefore failed to gain any marks.

ResultsPlus
Examiner Tip

All proteins have specific shapes that are important to their functions - not just enzymes and their active sites.

Question 7(e)

Many candidates failed to identify that there would be less chloride ions/water in the mucus, but described that the ions would move the wrong way, or not move (i.e. similar answers to some of the incorrect ones given in question 7(d))

When candidates did recognise that there would be an effect on the mucus they often simply said "sticky" rather than "stickier", not recognising that mucus is "sticky" in someone not affected by cystic fibrosis.

Some candidates recognised that this would affect the lungs, etc. but rarely gave examples of the consequences, or gave vague statements such as "digestive problems".

This is an example of a response that gained both marks available.

(e) For a person with class V cystic fibrosis, describe the effect of having smaller quantities of CFTR protein.

(2)

Less water is diffused into the mucus and so the mucus is thicker than a normal persons. This can lead to a greater risk of lung injections and coughs. It can also prevent the cilia from functioning normally as the mucus is too thick to move.

ResultsPlus
Examiner Comments

This candidate has ably described the consequence of having less CFTR in terms of less water in the mucus, the effect on the mucus and the consequences of the thicker mucus in the lungs.

This response did not gain any marks.

(e) For a person with class V cystic fibrosis, describe the effect of having smaller quantities of CFTR protein.

(2)

Water, ~~not enough to regulate~~ cannot be regulated as quickly or efficiently due to the limits on CFTR proteins present

ResultsPlus
Examiner Comments

This response is typical of those that lacked sufficient precision for credit at this level.

Question 7(f)

This question was left blank by a significant number of candidates. Reference to enzymes frequently gained a mark, but few candidates applied their knowledge of protein structure and consequently failed to refer to peptide bonds or hydrolysis.

Many candidates referred to the weakness of bonds in the protein or that the protein spontaneously broke down because it was unstable.

This response gains both marks available.

(f) For class VI cystic fibrosis, suggest how the CFTR protein is broken down.

(2)

Enzymes hydrolyse the protein over time breaking the peptide bonds between amino acids.

ResultsPlus
Examiner Comments

This candidate makes three creditworthy statements in a clear and concise response. The involvement of enzymes, the type of reaction and what is broken.

This response gained one of the two marks available.

(f) For class VI cystic fibrosis, suggest how the CFTR protein is broken down.

(2)

The CFTR protein is broken down by enzymes
~~hydrolysis the use of water~~
There are more substrates than allelic binding sites therefore this disrupts the synthesis of the protein.
genetic mutation

ResultsPlus
Examiner Comments

This is a typical response that gained credit for recognising that an enzyme must be involved. However, the rest of what they have written is irrelevant and they have not specified what is broken or what reaction takes place.

This response scored no marks.

(f) For class VI cystic fibrosis, suggest how the CFTR protein is broken down.

(2)

The CFTR protein may break down because the ionic, hydrogen bonds and disulphide bridges ~~and~~ may not be very strong. If not then these bonds will break very easily maybe due to a slight rise in temperature. This will then cause the protein to unfold and not function.

(Total for Question 7 = 12 marks)

ResultsPlus

Examiner Comments

This response is typical of many who related the question to the overall stability of the protein and the bonds in the secondary and tertiary structures.

Question 8(a)

The vast majority of candidates gained the mark for their description of the correlation for this data. Some candidates just stated that there was a positive correlation and others described how alcohol concentration caused cirrhosis.

Some candidates merely stated that as one variable changed so did the other without being specific to alcohol consumption and risk.

There were some candidates who misinterpreted the labels e.g. days of alcohol consumption, rate of cirrhosis, or even how many relatives suffered from cirrhosis.

(a) The results of these studies indicate that there is a correlation between alcohol consumption and cirrhosis.

Explain how these results indicate that there is a **correlation** between alcohol consumption and cirrhosis.

(1)

- There is a positive correlation between alcohol consumption and cirrhosis.
- As the alcohol consumption increases the relative risk of developing cirrhosis increases.

ResultsPlus
Examiner Comments

This is typical of the many good responses that gained the mark.

This response did not gain the mark.

(a) The results of these studies indicate that there is a correlation between alcohol consumption and cirrhosis.

Explain how these results indicate that there is a **correlation** between alcohol consumption and cirrhosis.

(1)

Changes in alcohol consumption result in changes ~~in~~ in the risk of developing cirrhosis.

ResultsPlus
Examiner Comments

This is a description of a causal link rather than a correlation and the candidate has not used the data to describe the direction of the correlation.

ResultsPlus
Examiner Tip

Remember that a correlation does not always signify a causal relationship so be careful to distinguish between the two when asked.

Question 8(b)(i)

Most candidates could compare the results for the different women well and identify the general trend of both and differences. However the scale proved difficult for many of them to be able to use – many manipulated figures were incorrect. Marks were also lost by candidates misinterpreting the graph and thinking that it was to do with rate or that it was to do with whether one group drank more than the other. 'Group A had a greater risk when consuming less alcohol', or similar, was a common answer.

This response gained both marks available.

(b) (i) Using the information in the graph, compare the results for women in studies A and B.

(2)

Both groups of women had an increased risk of developing ~~cccc~~ cirrhosis as their alcohol consumption increased in study A, the increased risk was much steeper – reaching a relative risk level of 4 when their consumption was 30g day^{-1} whilst for study B, consumption was 47g day^{-1} before the risk got to 4. After 30g day^{-1} for group A, the risk increased steeper with subsequent additions in alcohol consumptions whereas the risk for group B women got steeper after 40g day^{-1} of alcohol was consumed.

ResultsPlus
Examiner Comments

This is an example of a very good response where the candidate recognises the similarities in the two data sets as well as picking out specific differences with precision by comparing specific figures from the graph.

ResultsPlus
Examiner Tip

Many candidates got muddled in this question by discussing rates, which is not appropriate to this set of data as no rates have been measured or can be determined from the data. This candidate correctly avoided this by using language that describes the gradients of the lines and not changes with time.

This response failed to score any marks.

(b) (i) Using the information in the graph, compare the results for women in studies A and B.

(2)

women in study B who consumed more alcohol had a lower risk of developing cirhosis than the women in study A.

women in study A had a higher incidence of developing cirronsis after 30 days of consuming alcohol than the women in study B.

ResultsPlus

Examiner Comments

This example illustrates several of the problems many candidates found with this question:

- The first statement is ambiguous and is wrong for many levels of alcohol consumption;
- The second statement does not make a clear comparison to study B;
- The second statement is wrong as days are not measured in this study. The independent variable is not time, but alcohol consumption per day.

ResultsPlus

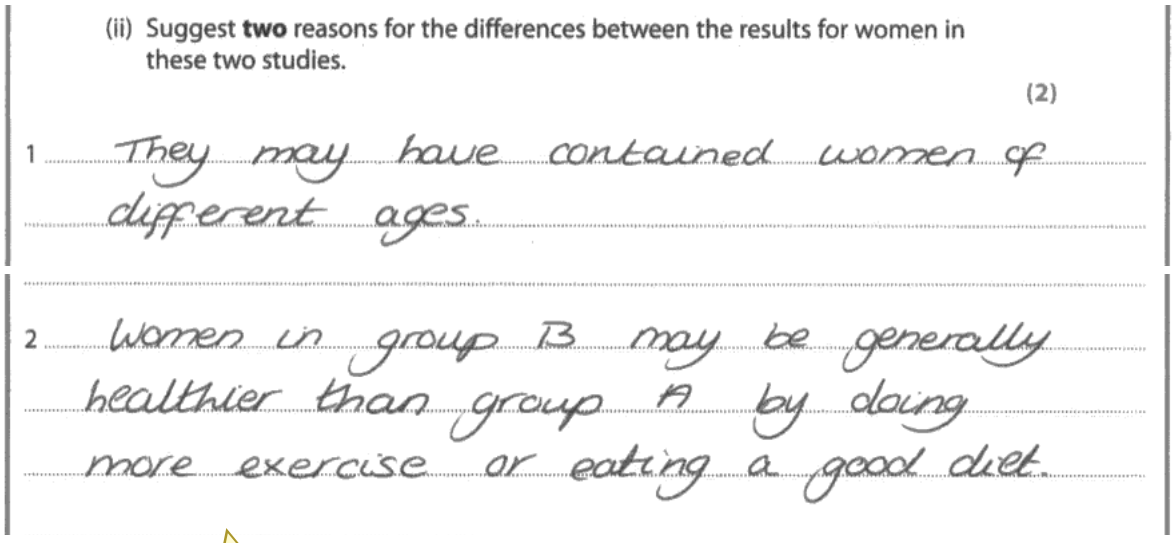
Examiner Tip

When you explore data from a graph pay particular note to what the labels and units for the axis are as that will often inform you what the independent and dependent variables for the investigation are, helping you to formulate conclusions, etc.

Question 8(b)(ii)

Many candidates scored both marks here with the most common correct answers being differences in age, diet or genetics. Often candidates had the right ideas but their answers were not precise enough to gain marks e.g. differences in lifestyle.

This response gained both marks available.



(ii) Suggest **two** reasons for the differences between the results for women in these two studies.

(2)

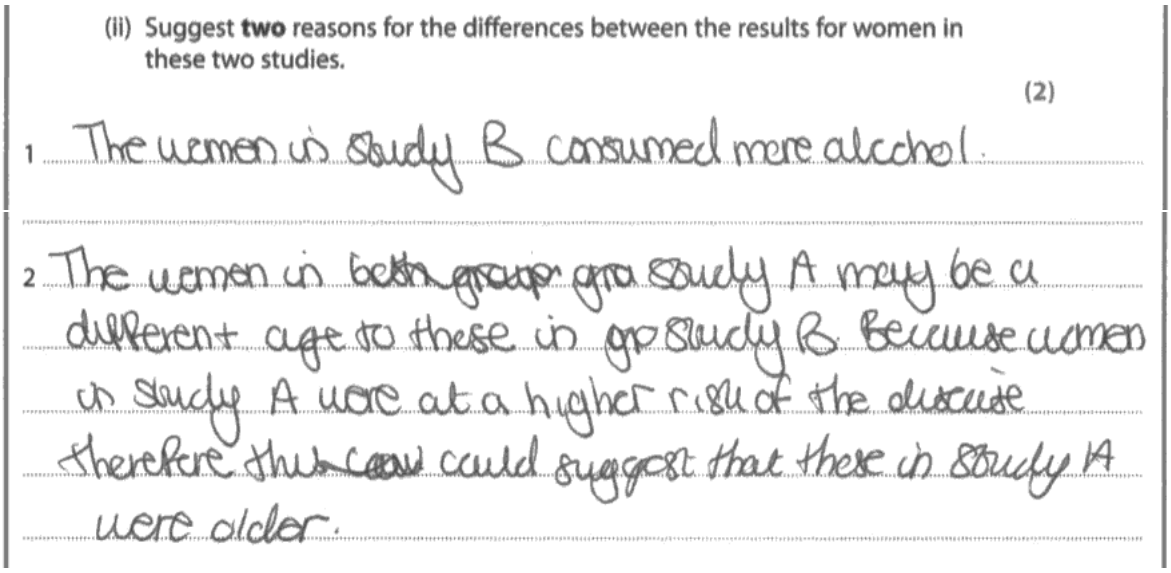
1 They may have contained women of different ages.

2 Women in group B may be generally healthier than group A by doing more exercise or eating a good diet.

ResultsPlus
Examiner Comments

Three clear reasons for possible differences in the results of the groups have been provided. NB: 'generally' healthier is not very precise, but the candidate has qualified this with reference to both exercise and diet.

This response gained one of the two marks available.



(ii) Suggest **two** reasons for the differences between the results for women in these two studies.

(2)

1 The women in Study B consumed more alcohol.

2 The women in both groups in Study A may be a different age to those in gp Study B. Because women in Study A were at a higher risk of the disease therefore this could suggest that those in Study A were older.

ResultsPlus
Examiner Comments

Although it is true that some of the women in study B did consume more alcohol than some of the women in study A, this is what was being measured and compared in the investigation and is therefore not a relevant reason for the difference to include here. Unlike age, which could be an uncontrolled variable in the study and therefore was credit worthy.

Question 8(c)

Once again the scale and multiple data sets proved difficult for many candidates to be able to use. Most candidates just looked at studies separately e.g. men in group A with women in group A and did not notice the same trends in the two studies. Marks were again lost by candidates misinterpreting the graph and thinking that it was to do with rate or that it was to do with whether one group drank more than the other. 'Women were more at risk when they drank less', or similar, was a common answer.

A significant number of candidates thought that men were at greater risk and tried to explain it due to hormone levels etc.

This response gained both marks.

(c) Describe the evidence shown in the graph that suggests that the risk of developing cirrhosis depends on gender.

(2)

- In both araps, women have a higher risk of developping cirrhosis before 60g day^{-1}.
- In arap A, men can drink 20 g day^{-1} more than women before the risk becaming over 4.

ResultsPlus
Examiner Comments

This candidate has made a relevant comparison between the women and men in the studies and backed it up with a calculation drawn from a couple of points of data to illustrate the main point they have made and gain the manipulation of figures mark.

This response gained no marks.

(c) Describe the evidence shown in the graph that suggests that the risk of developing cirrhosis depends on gender.

(2)

From the graph we can see that in Study A the men had a much higher risk of getting cirrhosis. than woman.

~~But in~~

ResultsPlus
Examiner Comments

This incorrect response is typical of those drawn by candidates who focussed on the extremes of the data provided, rather than making direct comparisons at the same alcohol or relative risk levels.

Question 8(d)

Many candidates confuse reliability and validity. Many candidates gained a mark for indicating that the sample size was not known, but many were more concerned with the number of studies undertaken.

A few recognised that the studies provided similar results or trends, but some said that the study was unreliable because the results were all so totally different from each other.

It was very rare for candidates to consider the lack of statistical evidence e.g. error bars or standard deviations.

Many candidates gave long lists of variables which were not controlled, e.g. ethnicity, age, health, etc.

This response gains both marks available.

(d) Comment on the reliability of these results.

(2)

As no information is provided regarding sample size and repititions, it is difficult to know. However, the fact that a similar pattern occurs for each study suggests a reliable set of data.

ResultsPlus
Examiner Comments

This candidate has recognised that the similar patterns suggest the results are reliable, but we don't know how many people are involved in each study (which will have a significant effect on confidence limits).

This response gains one of the two marks available.

(d) Comment on the reliability of these results.

(2)

There is no indicat as to the other variables which may affect risk, such as smoking, or the size of each study. Also a control group could help determine if alcohol is the variable affecting the results. A large group of people studied with similar age group would be more reliable

ResultsPlus
Examiner Comments

This candidate correctly recognises that we need to know the size of each study to assess the reliability of the studies. However, the other variables mentioned such as smoking and age are more related to validity than reliability and therefore were not credited here.

This response gained no marks.

(d) Comment on the reliability of these results.

(2)

the results aren't very reliable as there are no repeats and there is no controll group, also there are no averages calculated.

ResultsPlus

Examiner Comments

Many candidates main concern over reliability was the lack of repeats (although there was one) rather than the number of participants in each study and the statistical significance of any differences.

ResultsPlus

Examiner Tip

Don't forget that reliability includes the number of samples in a study as well as the number of times a study has been replicated.

Question 8(e)

Many candidates did not read this question properly and many answered "yes" to the question asked thinking the question asked 'is it …' instead of 'it is ….'

Most candidates who did answer the question asked demonstrated an understanding of why people underestimate – losing count due to drunkenness was a very common answer.

A few candidates referred to the perception of risk and the relationship between alcohol consumption and cirrhosis without making it clear why this would result in an underestimation of alcohol consumption.

This response gained the mark.

(e) It is possible that the men and women in these studies underestimated their alcohol consumption.

Suggest **one** reason for this.

(1)

inaccurate data provided; ie forgotten units/mass of alcohol consumed due to being heavily intoxicated; either forgetting amount consumed or understating.

(Total for Question 8 = 10 marks)

TOTAL FOR PAPER = 80 MARKS

ResultsPlus
Examiner Comments

This is typical of the most common correct response given for the reason for underestimation.

This response failed to gain the mark.

(e) It is possible that the men and women in these studies underestimated their alcohol consumption.

Suggest **one** reason for this.

(1)

Because many of the results show incredibly high rates of developing the disease.

ResultsPlus
Examiner Comments

Many responses to this question were confused and lacked clarity like this example.

ResultsPlus
Examiner Tip

You may have reached the end of the paper and you are tired and in a hurry, but it is worth spending some time reading questions carefully and checking your answers make sense.

This response did not gain the mark.

(e) It is possible that the men and women in these studies underestimated their alcohol consumption.

Suggest **one** reason for this.

(1)

yes as e.g. women in Study A for example who only drink 30g/day^{-1} are at the highest risk of it

ResultsPlus
Examiner Comments

This is a typical response of the many candidates who read the question as: 'Is it ....' rather than 'It is ....' As in this response these candidates often went on to look at the data for evidence of the underestimation instead of providing a reason the men or women may have underestimated their consumption.

ResultsPlus
Examiner Tip

Read the question carefully - was there a question mark at the end of the question sentence?

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question.
- Don't assume that the question asked is the same as that which has appeared on a previous paper.
- Read your answers back carefully – do they answer the question, have you made at least as many clear points as marks are available.
- When asked to distinguish between two things make sure your answer is comparative and mentions both things being compared.
- Include a calculation whenever you are asked to describe or compare numerical data in tables or graphs.
- Don't be afraid to include a sketch diagram or graph if it will help add clarity to your answer.
- When describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount.
- Pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions.
- Explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of questions, and exemplify the level of knowledge and understanding expected at AS level.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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